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System Documentation

For

Estimating Supplies Program (ESP)

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1. Introduction

This document describes the development process and functionality of the Estimating Supplies Program (ESP).

1.1 Background

The Naval Health Research Center (NHRC) designed, developed, and utilized a systematic process to review the U.S. Marine Corps medical supply requirements. This approach identified the medical tasks required to treat patients with specific injuries and illnesses, and determined the supplies and equipment required by each task. To determine the amount of consumable supply requirements, a patient-generating model was used to project the frequency of specific injuries and illnesses likely to occur in theater. Substantial reductions (approximately 30%) in the number of items, weight, and cube were achieved. By establishing the clinical requirement for each item pushed forward, the NHRC model was able to reduce the logistical burden carried by Marine Corps units and enhance far-forward clinical capability. One result of this research is an extensive database that catalogues patient conditions (PCs) and the tasks and supplies required to treat them. NHRC has incorporated the research and the database into ESP to provide users with the ability to calculate the supplies and equipment needed to treat a particular patient distribution.

1.2 Purpose

This system documentation is written to assist ESP users with planning medical resource requirements and to help ESP system administrators at NHRC with maintenance of the database and enhancements in program capability. It may also be used to perform an independent verification and validation of system capabilities.

1.3 Scope

ESP uses casualty estimates, levels of care, and functional areas to calculate the supplies necessary to treat a defined patient stream. ESP is capable of offering the following levels of care: First Responder, Battalion Aid Station (BAS), Forward Resuscitative Surgery (FRS)/Shock Trauma Platoon, Surgical Company (SC), Small Ships/Independent Duty Corpsman, Submarines, Landing Ship Dock/General Medical Officer, LHA/LHD, and Aircraft Carriers. ESP also offers the functional areas present at each specific level of care, and it may be expanded to cover all the listed levels and their respective functional areas in the future.

1.4 Overview

This document contains a general description of ESP, and detailed descriptions of its features and performance, design considerations, interfaces, security, delivery, installation, maintenance, and future development opportunities.

2. Hardware Interfaces

The system should run on any IBM-compatible personal computer, provided that it meets the minimum required configuration. A variety of printers are supported.

Hardware	Minimum	Preferred
Processor	386	Pentium class
MB RAM	16	32

3. Software Interfaces

This table shows the minimum software needed and the configuration of software preferred to run the application. Windows NT and Windows 95/98 are the assumed operating systems. The on-line Help system, built using Microsoft HTMLHelp, works with Internet Explorer (IE) 4.0 or higher. Furthermore, it is beneficial to the user to have Microsoft Word and Excel to view ESP output.

Software	Minimum	Preferred
Operating System	Windows 95 or NT3	Windows 98 or NT4
MS Office	97	97 or 2000
Web Browser	IE4	IE5

4. Communications Interface

ESP uses SMTP email client to email results of queries and reports to any recipient.

5. Delivery and Installation

The program espsetup.exe may be downloaded from the NHRC Web site (www.nhrc.navy.mil) under Modeling and Simulation Program, Resource page. The user must then run espsetup.exe from his or her local drive to install the program.

1. Close all applications in use on the machine.
2. Download espsetup.exe from the Web site.
3. Run espsetup.exe. The user chooses the location to save it in.
4. Restart the computer.
5. Run the executable se_1.exe to open ESP.

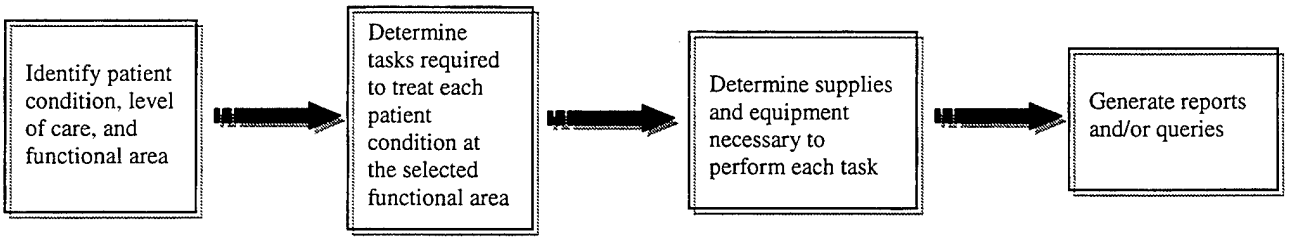
Log in and password are required to enter the program.

6. General Description of ESP

ESP allows the user to either generate the supplies required to treat a patient stream in the form of an ESP report, or to query the database to learn about the relationship among PCs, tasks, and supplies at specific functional areas in the form of an ESP query. The former requires a scenario, while the latter does not.

To run an ESP report, the user must establish a patient stream by selecting a defined scenario, copying and modifying a scenario, building a new scenario, or importing a scenario from an outside data source, such as an Excel spreadsheet. In each method, the user identifies a patient stream consisting of injuries and illnesses most likely to occur in deployments and conflicts, and selects level of care and functional area. ESP uses these inputs to determine the tasks to be performed and the concomitant supplies to be consumed in order to render care. The user may output these program results in many formats (e.g., Word document, Excel spreadsheet, or printed report). The user may also email the results to a specified recipient. Figure 1 shows the data flow diagram.

Figure 1. Data Flow Diagram



To execute an ESP query, the user must select level of care and functional area, and the type of query to run. For example, ESP queries can determine the tasks performed to treat a selected PC or the supplies required to perform a certain task.

6.1 Product Perspective

The system was developed using Microsoft Visual Studio 6.0. The tables, forms, libraries, reports, and queries were all designed using Visual FoxPro (VFP 6.0). Data are stored in VFP tables and retrieved using VFP queries and reports.

The design philosophy was to build an application that could use output from other software applications, such as casualty estimating programs, in several formats, and provide output in these same formats. The input and output of this software includes Excel spreadsheets, ASCII comma separated files and text files, dBase, FoxPro, Microsoft Word, and HTML tables.

6.2 User Characteristics

Anticipated users include individuals participating in training exercises, medical personnel conducting Authorized Medical Allowance List (AMAL) reviews, and NHRC systems administrators maintaining the database. The user should be familiar with computers and the Windows operating system. In order to run ESP, the user must be able to choose a defined scenario, build a patient stream by entering a number of patients for each PC, or build a patient stream by identifying how many patients are exhibiting each injury or disease type. The user must also select the level of care and functional areas where casualties receive treatment.

The structure of the system is based on two levels of access. The first level user (level 1) is a program developer who has access to data maintenance functions. The second level user (level 0) is an end user of the estimating software who does not have direct access to database tables. This structure was created to maintain database integrity. Furthermore, all users enter a password to enter the system (See Section 9, Security).

6.3 General Constraints

While many maintenance capabilities are built into the application, any significant system modification or enhancement must be performed by someone familiar with VFP 6.0. NHRC administrators will perform quarterly maintenance on the databases and provide updated installation packages as well as upgraded software.

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7. Features

The following sections describe specific ESP features, inputs, processing, outputs, and data (see Figure 2).

7.1 Specific Features

Where practical, the system attempts to prevent invalid data entry upon input. For example, when a user fails to select a PC but attempts to generate a query requiring one as a parameter, the system reminds the user to enter a PC.

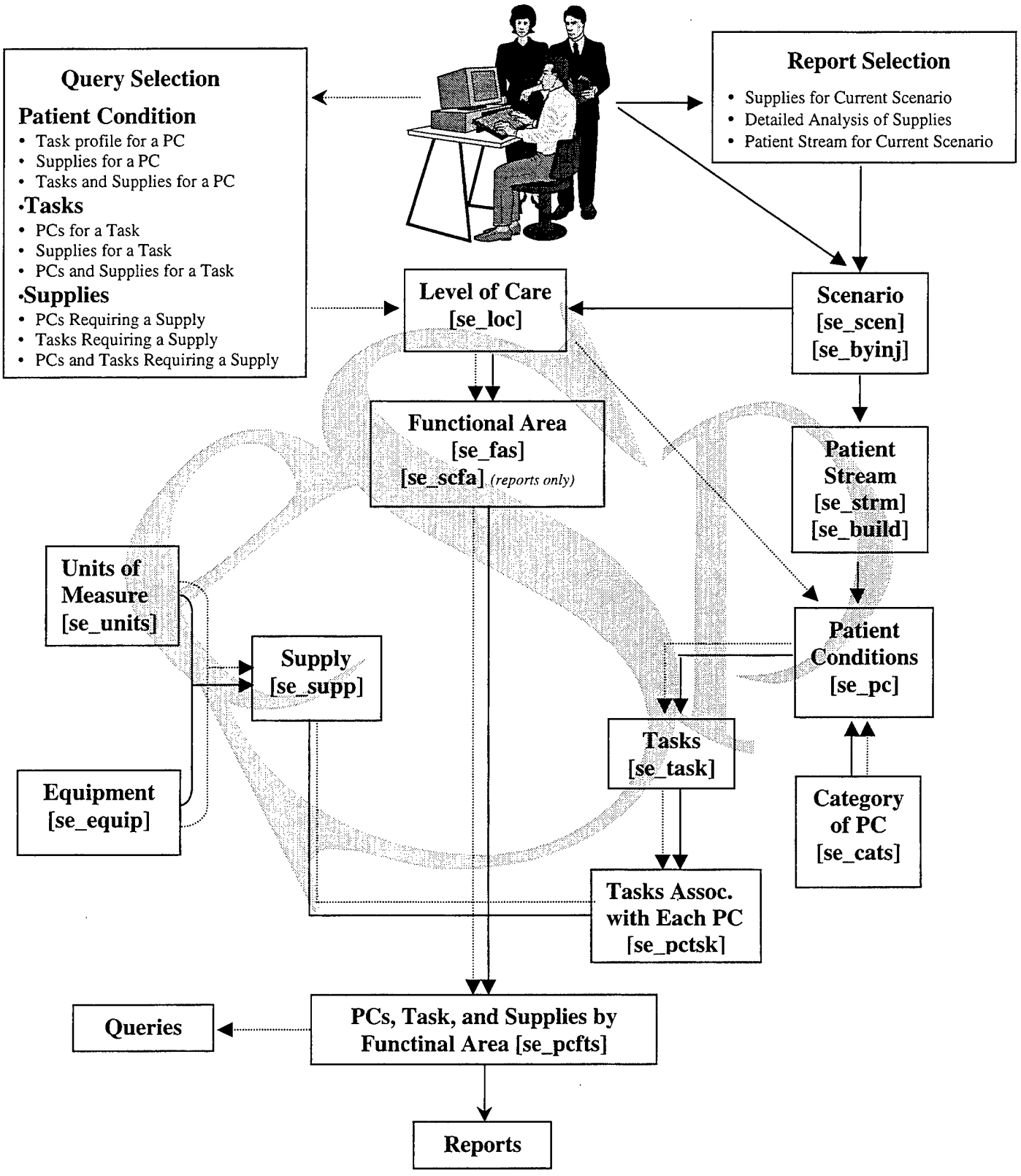
There are many calculations involved in determining the supplies necessary for a given patient stream. By storing the necessary information in tables, ESP queries the tables to get a result set. The tables used in the processing of PCs, tasks, and supplies are maintained by NHRC and may be updated on occasion to include new functional areas, revised treatments, new technology, or new injury or disease types. An algorithm is used to calculate the supply estimation necessary for a given patient stream for all of the PCs.

For all PCs, sum the following:
(number of patients * [Initial use * IPTS[1]] * quantity) + (number of patients * [Recur[2] * IPTS[1] * {ALOS[3]/24} – 1] * quantity)

[1] *IPTS is percentage of patients with a specific PC who require a specific task.*
[2] *Recur is the number of times the task is repeated after the first day of treatment.*
[3] *ALOS is the Average Length of Stay measured in hours.*

Figure 2. ESP Step-by-Step

Please note: *Dotted lines indicate tables used by queries. Solid lines indicate tables used by reports.*



7.2 Inputs

The user has the option to select a predefined scenario created by NHRC (e.g., Northeast Asia, Heavy Battle Intensity). The user may also copy an existing scenario and modify it, import a patient stream from another data source (e.g., Excel spreadsheet or ASCII text file created by a casualty estimator), or build a new scenario.

If the user chooses to build a new scenario, s/he may either enter the number of patients exhibiting each PC or enter the total number of casualties by injury and disease type. The user must also enter level of care and functional area, having the option to report on a subset of the selected functional areas. Scenarios are saved upon creation and users may then add, modify, or delete scenarios they create. Users may not modify nor delete scenarios created by another user. See the *ESP User's Guide* for more information on system capabilities.

7.3 Processing

When the user **[se_user]** starts ESP, s/he must decide whether to work with a scenario or query the database. If working with a scenario, the user must select a listed scenario, import an existing scenario from another file, or build a new one **[se_scen]**. Regardless of the selected option, the user must input level of care and functional area, and typically does so before actually building the patient stream. **[se_loc]** is a table that lists the available level of care (e.g., First Responder, BAS, SC), while table **[se_fas]** lists the available functional areas (e.g., Triage, Operating Room, Ward). Once the user chooses the desired inputs, ESP stores them in the **[se_scfa]** table.

When the user chooses to import a scenario, the data are copied to a .dbf file with the same name as the source file. The **[se_scen]** and **[se_strm]** tables are populated directly from the .dbf file.

When the user builds or modifies a scenario by PC, ESP references both the **[se_pc]** table that lists all available PCs by code number (e.g., PC 001 is cerebral concussion closed with/without nondepressed linear skull fracture severe—loss of consciousness from 2 to 12 hours), and the **[se_cats]** table that lists PCs by category. The PCs selected by the user are stored in the **[se_strm]** table. This table also contains the integral number of patients and the probability of these patients exhibiting the PC.

When the user builds a scenario by injury and disease type, ESP references the **[se_byinj]** table. This table stores the probabilities of casualties exhibiting injury and disease conditions by geographical location, how the condition occurred (e.g., wounded in action [WIA], nonbattle injury [NBI], disease), type of condition (e.g., burn, inhalation), and physical location (e.g., arm, head). The user selects casualties by these same criteria and the data are stored in the **[se_build]** table. The available injury/disease types are assigned a PC code. A probability is used to simulate a fractional (noninteger) number of patients between zero and one (this situation may also occur when importing data from an external source with noninteger patients). Then ESP divides the number of patients by the PCs assigned to that injury or disease type. However, the number of patients may not be evenly divisible by these PCs. If there is more than one patient, the system rounds off to the nearest integer. To avoid eliminating PCs or overestimating required supplies, the system converts patient numbers with the value of less than one to a probability, and replaces the number of patients with one. As a result, the total number of patients may slightly exceed the projected total of patients.

At this point, the user has completed building the patient stream. To generate a list of tasks associated with each PC in each functional area, ESP cross references the **[se_strm]** table with the **[se_task]** table, which lists all existing tasks required for the treatment of each PC. The result of this cross-reference is stored in **[se_pctsk]** as the list of tasks required to treat the patient stream. **[se_pctsk]** also contains the number of times the task is performed on Day 1, the number of times it is repeated on Day 2 and every subsequent day, the percentage of times the task is performed for the specific PCs, the average length of stay of a patient, and the treatment time.

Each task has a list of supplies required for performance at each functional area. The **[se_supp]** table is a list of supplies that includes nomenclature, National Stock Number (NSN), weight, cube, cost and type (ECD: equipment, consumable, durable). Units of measure are stored in **[se_units]** table and equipment items are listed in the **[se_equip]** table. The quantities of each supply required for each task performed at each functional area are extracted from the **[se_pcfts]** table.

The user now typically runs a report on the scenario (ESP still allows the user to select a query, if desired). Several reports offer ordering and subtotaling features and also allow the user to report on a subset of the selected functional areas. Lastly, the user identifies the desired format of the output (e.g., Word, Excel) as well as how to receive this output (e.g., save, print, email).

7.4 Outputs

ESP offers two types of output: reports and queries. A report includes data that are relevant to a defined patient stream. A query is information from the ESP database that is not dependent on a patient stream. Output is formatted landscape or portrait, depending on which orientation best suits the data displayed. Orientation is determined by the selection of the report/query and cannot be altered by level 0 users.

REPORTS

SUPP1	Supplies for Current Scenario
SUPPDET	Detailed Analysis of Supplies
PATSTRM	Patient Stream for Current Scenario

QUERIES

PCTASK	Patient Conditions for a Selected Task
SUPPTASK	Supplies for a Selected Task
SUPCTASK	Patient Conditions and Supplies for a Selected Task

Note: The user may enter text to search for a specific task.

PCSUPP	Patient Conditions Requiring a Supply
TASKSUPP	Tasks Requiring a Supply
PCTKSUPP	Patient Conditions and Tasks for a Supply

Note: The user may enter the last 4 digits of the NSN to search for a specific supply.

TASKPROF	Task Profile for a Patient Condition
SUPP3	Supplies for a Patient Condition
SUPP2	Tasks and Supplies for a Patient Condition

Note: The user may enter text to search for a specific PC.

The program listings are included in Appendix A of this document.

7.5 Data

The data entered by the users and the data used to calculate results are stored in Visual FoxPro tables contained in a database. The stored procedures in this database include a function to assign new unique keys when records are added to tables. Most tables also have a unique key field that contains a unique value generated by ESP to help maintain data integrity.

DATABASE DOCUMENTATION

♦USER

The **se_user** table is used to store data about users. The name, password, and user level are included.

Field Name	Short Name	Description	Values
user_id	user ID	unique identifier of the user	autogenerated integer
username	user name	name of user	text user input
userpass	user password	encrypted password of user	alphanumeric
userlvl	user level	level of access granted to the user	0 or 1

♦BUILDING A SCENARIO

The **se_byinj** table is used to build a scenario by injury or disease type.

Field Name	Short Name	Description	Values
byinj_id	by injury or disease ID	a unique identifier of the record in se_byinj	autogenerated integer
cat1_id	category 1 ID	nothing, injury, or disease	cat1_id from se_cat1
cat2_id	category 2 ID	injury or disease type ID	cat2_id from se_cat2
cat3_id	category 3 ID	injury or disease location ID	cat3_id from se_cat3
cat4_id	category 4 ID	specific location ID	cat4_id from se_cat4
geo_id	geographic ID	identifies geographical location of injury or disease	NE Asia, SWAsia, NATO, etc.
wnd_id	WIA, NBI, disease	identifies type of injury	1, 2, or 3
pc_id	PC ID	patient condition ID	pc_id from se_pc
byinj_pro	probability	encrypted probability of injury or disease occurring	numeric value from 0 to 100

The **se_scen** table is used to store information about the scenarios. It also identifies who created the scenario and stores a short description of the scenario.

Field Name	Short Name	Description	Values
scen_id	scenario ID	unique identifier of records in the table	autogenerated integer
scenario	scenario	short name of scenario	text
scendesc	scenario description	long name of scenario to be displayed to users	text
user_id	user ID	the ID of the user who created the scenario	user_id from se_users
avail	available	is the scenario available to users	true or false
scen_type	scenario type	type of scenario based on how it was built, patient condition, injury or disease	pc or id
scen_memo	scenario memo	comments about the scenario, more detailed description, or origin information	memo

♦LEVEL OF CARE

The **se_loc** table is used to store the level of care information that has been selected by the user.

Field Name	Short Name	Description	Values
loc_id	LOC ID	unique identifier of the level of care	autogenerated integer
locdesc	LOC description	name to be displayed	text
loccode	LOC code	short code to be displayed	text
service	branch of service	branch of service	text
loc_seq	LOC sequence	sequence to be displayed	autogenerated integer
rep_loc	report LOC	current report includes this level of care	true or false
avail	LOC available	is the level of care available to users	true or false

♦FUNCTIONAL AREA

The **se_scfa** table is used to store information about the functional areas selected for each scenario.

Field Name	Short Name	Description	Values
scen_id	scenario ID	unique identifier of records in the table	scen_id in se_scen
fa_id	FA ID	functional area ID	fa_id in se_fas

The **se_impfa** table is used to identify which functional areas are to be imported for which scenarios.

Field Name	Short Name	Description	Values
imprg_id	import program ID	import program ID	imprg_id from se_imprg
fa_id	FA ID	functional area ID	fa_id from se_fas

The **se_fas** table is used to store functional areas and level of care.

Field Name	Short Name	Description	Values
fa_id	FA ID	a unique identifier of functional area	autogenerated integer
fa	FA	character functional area used to relate it to the old system	text
fa_desc	FA	full name of the functional area	text
ech	echelon code	short code for the echelon in the old system	two characters
old_fa	Old FA	functional area ID for the original version of ESP	autogenerated integer
loc_id	LOC ID	level of care ID	loc_id from se_loc
include	include the FA	include the functional area in the current scenario	true or false
increp	include FA in report	include functional area in report	true or false
avail	make FA available	make functional area available to user	true or false
incimp	include FA in import	include functional area in import	true or false
fa_seq	FA sequence	functional area sequence to display	autogenerated integer

♦PATIENT STREAM

The **lv_addpcs** local view is used to add patient condition to a patient stream.

Field Name	Short Name	Description	Values
pc_id	PC ID	a unique identification of the patient condition	pc_id from se_pc
cat_id	category ID	unique identifier of category	cat_id from se_cats
pc	PC number	the character number from the old patient condition numbering scheme	001 to 350
pcdesc	PC description	description of the patient condition	any text
num_pat	number of patients	number of patients with the patient condition that should be added to the patient stream	autogenerated integer

The **se_build** table is used to build a patient stream by injury or disease type with a desired level of detail. For instance, the user can choose an injury type (i.e., fracture), the location of the injury (i.e., upper extremity), and the specific location (i.e., forearm).

Field Name	Short Name	Description	Values
bld_id	build ID	a unique identifier of the record in se_build	autogenerated integer
scen_id	scenario ID	a unique identifier of the scenario being built	scen_id from se_scen
wnd_id	WIA, NBI, disease	identifies type of injury	1, 2, or 3
geo_id	geographic ID	identifies geographical location of injury or disease	NE Asia, SWAsia, NATO, etc.
bld_num	number	number of patients with the injury or disease	autogenerated integer
cat1_id	category 1 ID	nothing, injury, or disease	cat1_id from se_cat1
bld_inj	injury or disease	character	cat_1 from se_cat1
cat2_id	category 2 ID	injury or disease type ID	cat2_id from se_cat2
bld_type	injury or disease type	type description	cat_2 from se_cat2
cat3_id	category 3 ID	injury or disease location ID	cat3_id from se_cat3
bld_loc	injury or disease location	location description	cat_3 from se_cat3
cat4_id	category 4 ID	specific location ID	cat4_id from se_cat4
bld_spec	specific location	specific location description	cat_4 from se_cat4

The **se_cat1** table is used by many functions in the application to differentiate between injury and disease at the highest level.

Field Name	Short Name	Description	Values
cat1_id	category 1 ID	nothing, injury, or disease	0, 1, 2
cat_1	category 1	character nothing, injury, or disease	text

The **se_cat2** table is used to classify injuries and diseases into types of resources.

Field Name	Short Name	Description	Values
cat2_id	category 2 ID	a unique identifier of category 2	autogenerated integer
cat_2	category 2	description of the type of injury or disease	text

The **se_cat3** table is used to further classify injury or disease types by bodily location of injury.

Field Name	Short Name	Description	Values
cat3_id	category 3 ID	a unique identifier of category 3	autogenerated integer
cat_3	category 3	description of location of injury or disease	text

The **se_cat4** table is used to further classify injury or disease types by specific bodily location.

Field Name	Short Name	Description	Values
cat4_id	category 4 ID	a unique identifier of category 4	autogenerated integer
cat_4	category 4	description of location of injury or disease	text

The **se_cats** table is used to classify injuries and diseases.

Field Name	Short Name	Description	Values
cat_id	category ID	a unique identifier of category	autogenerated integer
cat_code	category code	short name of category	text
category	category	description of category	text
cat_seq	category sequence	sequence of category for display	autogenerated integer

The **se_strm** table is used to store information about the patient streams when building by injury or disease.

Field Name	Short Name	Description	Values
strm_id	stream ID	unique identifier of the stream table	autogenerated integer
scen_id	scenario ID	unique identifier of scenario	scen_id in se_scen
pc_id	PC ID	unique identifier of the patient condition	pc_id in se_pc
prob	probability	probability of the patient condition occurring in the scenario	numeric
num_pat	number of patients	number of patients exhibiting the patient condition in the scenario	numeric

♦PATIENT CONDITIONS

The **se_pc** table contains the patient conditions.

Field Name	Short Name	Description	Values
pc_id	PC ID	patient condition ID	autogenerated integer
cat_id	category ID	category that the patient condition fits	cat_id from se_cats
pc	PC	old patient condition to allow matching old system	four character
pcdesc	PC description	patient condition description	text
num_pat	number of patients	number of patients with the patient condition a temporary field	numeric

The **lv_byinj** is a local view used to capture the injury types and assign probabilities.

Field Name	Short Name	Description	Values
cat1_id	category 1 ID	main category injury or disease	cat1_id from se_cat1
cat2_id	category 2 ID	types of injuries or diseases	cat2_id from se_cat2
cat3_id	category 3 ID	location of injury or disease	cat3_id from se_cat3
cat4_id	category 4 ID	more specific info about injury	cat4_id from se_cat4
geo_id	geographic ID	unique identifier of geographical location	1 NE Asia, 2 SW Asia, 3 Europe
wnd_id	WIA, NBI, or disease	wounded in action, nonbattle injury or disease	1 WIA, 2 NBI, 3 Disease
pc_id	PC ID	patient condition ID	pc_id in se_pc
byinj_pro	by injury	encrypted injury probability	any numeric value
byinj_id	by injury ID	unique ID for by injury entry	autogenerated integer

♦TASKS

The **se_task** table identifies the task number and the description of each task.

Field Name	Short Name	Description	Values
task_id	task ID	unique identifier of the task	autogenerated integer
task	task number	the old number of the task	3 characters
taskdesc	task description	description of the task performed	text

The **se_pctsk** table relates patient conditions to the tasks performed on those conditions. It also describes how many times the patient requires specified treatment, how long the treatment takes to perform, and the patient's length of stay.

Field Name	Short Name	Description	Values
pctsk_id	pcfts ID	unique identifier of records in the table	autogenerated integer
pc_id	PC ID	patient condition ID	pc_id from se_pc
fa_id	FA ID	functional area ID	fa_id from se_fas
task_id	task ID	task ID	task_id from se_task
init	init	initial number of times treatment is performed on patient	integer
recur	recurring	number of times the treatment is performed after the first time for each subsequent 24-hour period	integer
alos	average length of stay	the length of time in hours that the patient remains	integer
ttime	treatment time	the time in minutes it takes to perform the treatment	integer

♦**SUPPLIES**

The **se_supp** table is used to store information about supplies. The table provides the primary names of the supplies as well as the shortened identifier of each supply. It also gives the weight, cubic volume, cost, and the type (whether it is equipment, medical, consumable, or durable item) of each supply.

Field Name	Short Name	Description	Values
supp_id	supply ID	unique identifier of the supply	autogenerated integer
nomen	nomenclature	short name of supply	text (42 characters)
org nomen	original nomenclature	longer original name of supply	text
nsn	national supply number	a supply number used to acquire the supply	number (13 characters)
um	units of measure	the units of measure	2 characters
div_by	divide by	the number of supplies in a package	numeric
weight	weight	the unit weight of the supply	numeric
cube	cube	the cubic volume of the supply	numeric
cost	cost	the unit cost of the supply	numeric
ecd	ECD	the type of supply (equipment, consumable, durable)	1, 2, or 3, respectively

♦ **UNITS OF MEASURE**

The **se_units** table is used to store information about the units of measure of each supply.

Field Name	Short Name	Description	Values
unit_id	unit ID	unique identifier of the unit of measure	autogenerated integer
um	unit of measure	abbreviation for the unit of measure	2 characters
unitdesc	unit description	description of the unit of measure	text

♦ **EQUIPMENT**

The **se_equip** table may be used to relate equipment to consumables and durables.

Field Name	Short Name	Description	Values
eq_supp_id	equipment supply ID	a unique identifier of equipment	supp_id from se_supp
cd_supp_id	consumable or durable ID	unique identifier of consumable and durables	supp_id from se_supp

♦ **TASKS ASSOCIATED WITH EACH PATIENT CONDITION**

The **se_pcfts** table relates to several other tables and is used in many of the calculations involving supplies. It provides information on the supply quantity necessary for the specified patient condition and task within that functional area.

Field Name	Short Name	Description	Values
pcfts_id	pcfts ID	unique identifier of records in the table	autogenerated integer
pc_id	PC ID	patient condition ID	pc_id from se_pc
fa_id	FA ID	functional area ID	fa_id from se_fas
task_id	task ID	task ID	task_id from se_task
supp_id	supply ID	supply ID	supp_id from se_supp
loc	LOC	link to old level of care	character
quant	quantity	quantity of supply required for the associated task and patient condition in the identified functional area	text

♦REPORTS AND QUERIES

The **se_parm** table is used to store information about parameters required for ordering and subtotaling variables in the output.

Field Name	Short Name	Description	Values
parm_id	parameter ID	unique ID for each parameter	autogenerated integer
rep_id	report ID	foreign key to report	rep_id from se_reps
ptype	parameter type	type of parameter	O order, F filter, S subtotal
parmdesc	parameter description	description of the parameter to be displayed to users	text
o_desc	order descending	the order is descending; for order type parameters only	true or false

The **se_repgp** table is used to group output.

Field Name	Short Name	Description	Values
repgp_id	report group ID	unique identifier of records in the table	autogenerated integer
rg_desc	report group description	name of report group to be displayed to users	text

The **se_reps** table is used to store information about the output available to users.

Field Name	Short Name	Description	Values
rep_id	report ID	unique identifier of records in the table	autogenerated integer
repdesc	report description	name of report to be displayed to users	text
repgp_id	repgp_ID	report group ID	integer
repfile	report file	the full path of the report file	frx file
w_scen	with scenario	does this report have to be run with a scenario	true or false
repquery	report query	the code run to query the database and retrieve the data for the report	memo
prgfile	program file	the full path of the program file that is stored in repquery	prg file

The **lv_rorq** is a local view that accepts two parameters. The first is **vp_rq** and represents whether the user wants reports or queries. The value may be either true for reports or false for queries. The second parameter is **vp_gp** and is a character representation of the report group ID from **se_repgp**. The view is used to display the reports or queries in the currently selected group.

Field Name	Short Name	Description	Values
repdesc	report description	a description of the report	any text value
rep_id	report ID	unique report identifier	rep_id from se_rep
repgp_id	report group ID	unique report group identifier	repgp_id from se_repgp
w_scen	with scenario	does the report require a current scenario selection	true or false

The **se_sets** table is used to store information about the surgical sets and where they are located.

Field Name	Short Name	Description	Values
set_id	set ID	unique identifier of surgical set	autogenerated integer
task_id	task ID	task identifier	task_id from se_task
fa_id	FA ID	functional area ID	fa_id in se_fas
set_seq	sequence	set sequence for reporting	integers
numsets	number of sets	number of sets per functional area	integers
setname	set name	name of set	text

The **se_setsp** table is used to store information about the supplies contained in each set.

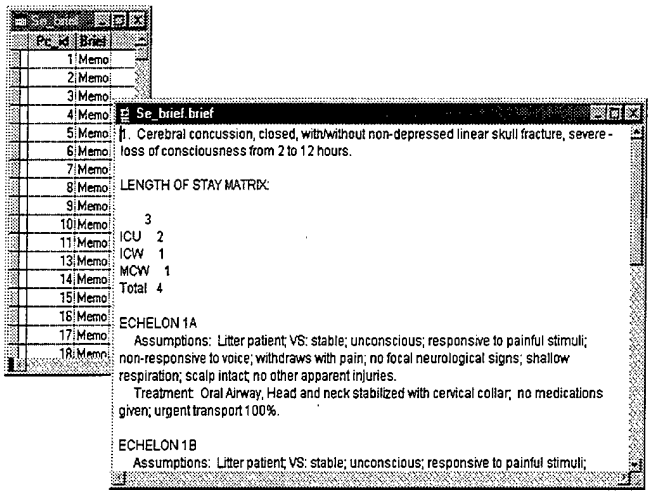
Field Name	Short Name	Description	Values
setsp_id	setsp ID	unique identifier of the set supply	autogenerated integer
set_id	set ID	unique identifier of surgical set	set_id in se_sets
supp_id	supply ID	unique identifier of the supply	supp_id in se_supps
quant	quantity	quantity of supply in the set	autogenerated integer

♦THE FOLLOWING ARE USED AS REFERENCES FOR OTHER TABLES

The **se_faeq** table contains the quantity of supplies within a functional area. It is also used to store nonset equipment items.

Field Name	Short Name	Description	Values
fa_id	FA	functional area	fa_id
supp_id	supply	supply identification	supp_id
quant	quantity	nonset supply quantity	integer

The following is a picture of the **se_brief** table that stores the treatment briefs maintained by the Joint Readiness Clinical Advisory Board (JRCAB). The briefs are stored in a memo field for each patient condition.



Se_brief table:

Field Name	Short Name	Description	Values
pc_id	PC ID	a unique identifier of the patient condition	pc_id from se_pc
brief	treatment brief	JRCAB treatment brief	JRCAB treatment brief

The **fa_tsk** table is used to display the tasks and functional areas where they are performed. This table is a result of a cross-tabulation of the functional areas in table **se_fas** and the tasks in table **se_tasks**.

Field Name	Short Name	Description	Values
task_id	task	task identifier	task_id
firstresp	first responder	first responder	true or false
bas	BAS	Battalion Aid Station	true or false
frstriage	FRS triage	Forward Resuscitative Surgery	true or false
frsor	FRS OR	Forward Resuscitative Surgery	true or false
frspostop	FRS post Op	Forward Resuscitative Surgery Post Operation	true or false
sctriage	SC triage	Surgical Company	true or false
sc_or	SC OR	Surgical Company	true or false
scward	SC ward	Surgical Company	true or false
scxray	SC X-ray	Surgical Company	true or false
sclab	SC lab	Surgical Company Laboratory	true or false

The **se_fsow** table is used to report PCs treated within a functional area. This table is a result of a cross-tabulation of the functional areas in table **se_fas** and the PCs in table **se_pc**.

Field Name	Short Name	Description	Values
pc_id	PC	patient condition identifier	pc_id
firstresp	first responder	first responder	true or false
bas	BAS	Battalion Aid Station	true or false
frstriage	FRS triage	Forward Resuscitative Surgery	true or false
frsor	FRS OR	Forward Resuscitative Surgery	true or false
frspostop	FRS post Op	Forward Resuscitative Surgery Post Operation	true or false
sctriage	SC triage	Surgical Company	true or false
sc_or	SC OR	Surgical Company	true or false
scward	SC ward	Surgical Company	true or false
scxray	SC X-ray	Surgical Company	true or false
sclab	SC lab	Surgical Company Laboratory	true or false

The **fa_sup** table is used to display each supply and the functional areas in which it is used. This table is a result of a cross-tabulation of the functional areas in **se_fas** and the supplies in **se_supp**.

Field Name	Short Name	Description	Values
supp_id	supply	supply identifier	supp_id
firstresp	first responder	first responder	true or false
bas	BAS	Battalion Aid Station	true or false
frstriage	FRS triage	Forward Resuscitative Surgery	true or false
frsor	FRS OR	Forward Resuscitative Surgery	true or false
frspostop	FRS post Op	Forward Resuscitative Surgery Post Operation	true or false
sctriage	SC triage	Surgical Company	true or false
sc_or	SC OR	Surgical Company	true or false
scward	SC ward	Surgical Company	true or false
scxray	SC X-ray	Surgical Company	true or false
sclab	SC lab	Surgical Company Laboratory	true or false

7.6 User Interface

The level 0 user has access to only those areas of the application that are necessary for building a patient stream, and selecting level of care, functional area, and output type. The level 0 user does not have access to the database in order to maintain database integrity and reduce user confusion.

8. Design Constraints

Windows Graphical User Interface Standards were followed. Object Oriented Programming techniques were employed where appropriate. The Visual Classes developed for and used in this application are listed below:

Class	Use
Oleauto	responsible for Microsoft Office automation (controlling Word and Excel)
Se_vcx	application object and main toolbar object classes
Sfmapi	email class allows users to email results of output
Sfctrls	controls used by sfmapi
Tdcntrls	set of controls that allow flexible resizing of forms, grids, options
Wizbase	Microsoft supplied wizbase class
Wizbtns	Microsoft supplied buttons for wizbase
Wizembss	Microsoft supplied class to give wizard embossed look
_app	Microsoft supplied application class
_base	Microsoft supplied base class
_html	Microsoft supplied html class
_htmlsty	Microsoft supplied html style class
_movers	Microsoft supplied mover class

9. Security

The following section describes the system security, which differentiates between NHRC (level 1) users and general users (level 0).

9.1 Program Developers

The system stores the operator's **user_id** and user level (**userlvl**) in the **[se_user]** table. NHRC users are given a level 1 (one); all other users are given a level 0 (zero). Users assigned a security level 1 are granted access to maintenance forms (see Section 10). Users assigned a level 0 are not able to modify the output formats, and they have read-only access to data files. Probability and user password values are safeguarded.

9.2 General Users/Custodians

The **user_id** of the person who first created a scenario is stored in the table of scenarios **[se_scen]**. This user is tagged as the "custodian" of the scenario. The application keeps track of who is currently logged on to the system. If the current user is also the custodian of the scenario in use, the system allows the user to modify the scenario (read-write access). If the current user has a level 0 but s/he is not the custodian of the scenario, the application allows read-only access to the user. If the current user has a level 1, the system allows the user to modify any scenario (read-write access). When a user logs on for the first time, a user level 0 is assigned automatically, therefore, allowing the user to read existing scenarios and create new ones. On

subsequent log ins, users can create new scenarios, modify their own scenarios, and read others' scenarios.

10. Maintenance

Users granted access to maintenance (level 1) may perform maintenance on output, levels of care, functional areas, PCs, and data import. The same fundamental steps can be used when maintaining levels of care, functional area, PCs, and the data import screens.

10.1 Program Maintenance

The first form available for program maintenance is designed to update tables **[se_fsow]**, **[fa_tsk]**, and **[fa_sup]**. These tables show functional areas where PCs are treated, functional areas where tasks are performed, and functional areas where supplies are used, respectively. The maintenance form is simply three check boxes and a command button. Level 1 users check the table(s) to update, then click the Update command button. This should be run by NHRC whenever new data are put into ESP and before shipping a new version.

The second maintenance form is designed to update table **[se_faeq]**, which lists the functional areas where equipment items are used, and the quantities of equipment items that are not part of a set. Level 1 users utilize the toolbar to move through the records (e.g., Back, Next), add a new record, or delete a record. Level 1 users can also change the field of an existing record.

The third form, described below, was developed to allow level 1 users the ability to create their own output formats while in the application. Programs may be recompiled and tested while the application is running, thus avoiding a recompiling operation each time the user wants to modify a query or report format. Level 1 users can maintain new levels of care, PCs, updated tables, and imported data. Users assigned a level 0 are not able to modify the report and query forms. Below is an example of how to create a new output format:

1. Select Maintain Reports from the main menu to bring up the report and query form.
2. Click the New button on the toolbar.
3. Enter a unique description for the output.
4. Indicate (check) whether the output must be tied to a specific scenario. If this is not selected, the output reports on data that do not require a patient stream.
5. Assign a group name to allow the output to appear when the user selects a group.
6. Enter the name of the program file. This is where the code to bring all of the data together for the output is stored. The user may also locate an existing program file by clicking the button with the ellipses (...). This button opens a dialog allowing the user to find the file.
7. Enter the name of the output file. This is where the output format is stored. Alternatively, the user may locate an existing output format by clicking the button with the ellipses (...). This button opens a dialog box allowing the user to find the file.
8. Use Edit buttons to edit the output after it has been created.

9. Enter the parameters you want to use for the output, within the grid.

10. First, select a type. Types are: F = Filter, O = Order, S = Subtotal. The type determines which options the user is presented with when reporting.
    10 a. A filter limits the output to a specific item. For example, if the user selects Filter and enters field name fa_id, then the output presents the user with functional areas to choose when reporting.
    10 b. Order gives the user the option to sort the results by the field(s) that the user enters.
    10 c. Subtotal gives the user the option to subtotal results by the field(s) that the user enters.

11. Select the field that the Filter, Order, or Subtotal should operate on in the output. **You must enter the field names exactly as they are in the database table.**

12. Enter the description that appears to the user to explain the Filter, Order, or Subtotal.

13. If the user selects Order, the user may select Descending to allow the user to print results in descending order.

14. All of these selections merely modify the user interface to present options to users running this output. To make these meaningful, the program and/or output must employ the parameters that the users enter. Existing programs may be studied for examples of how these parameters are employed.

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11. Documentation

This system is detailed by means of this system document, a user's guide, and an on-line help facility with hypertext capability. Appendix A is a program listing of the code run to generate the reports and queries. Appendix B is a 690-page code diagram listing that includes Nesting levels.

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12. Future Development Opportunities

Expand the algorithms to include other factors

The ESP model may be modified to include number of shelters to deploy and number of patient treatment positions that fit in a shelter. Furthermore, ESP can be broadened to include many other parameters, such as number of pieces of equipment per shelter, number of personnel available, equipment issued to personnel, equipment or durable consumption per patient or per bed, and number of uses before equipment fails or needs to be replaced.

Load data into the system to handle other levels of care and functional areas.

The model may be expanded to handle other levels of care by determining the treatments given at new functional areas and adding that information to the database.

Add databases, queries, and reports as they are requested by users after delivery.

After delivery, user feedback may provide important guidance as to how NHRC can upgrade the system to better serve its users.

Internet enable the application.

The application may be deployed on the Internet to reach a more global audience.

13. Glossary

Database - A collection of Tables and Views with associated stored procedures.

Entity - A person, thing, or abstract business concept. In database design, it is the thing that the table represents.

Field - A single column of information in a table.

Foreign Key A Primary Key from one table that is in another table to establish a relationship between the two tables.

Patient Condition - An injury or disease that corresponds to a patient condition code number and is exhibited by a patient.

Patient Stream - A list of patient conditions and the associated number of patients exhibiting that condition.

Primary Key - A unique identifying value in a record of a table.

Record - A single row of information in a table.

Scenario - A situation that results in a patient stream. Also, often used as a synonym of patient stream.

Stored Procedure - Code within a database used to maintain tables, assign key values.

Supply - A piece of equipment, durable item, or consumable item that is used in the treatment of patients.

Table - Information about a particular entity stored in a series of records with the same fields.

Task - A medical procedure performed on a patient.

View - The updateable result of a query. Several views are stored in the database. A parameterized view requires parameters that are used in running the query to produce the result. An example of a parameterized view is lv_addpcs, which accepts the current scenario and the current category as parameters and returns the set of patient conditions in the current category that are not included in the current scenario. This view is suitable for selecting patient conditions to add to the patient stream.

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13. SUPPLEMENTARY NOTES

14. ABSTRACT (maximum 200 words) The Naval Health Research Center (NHRC) designed, developed, and utilized a systematic process to review the Marine Corps medical supply requirements. This approach identified the medical tasks required to treat patients with specific injuries and illnesses, and determined the supplies and equipment required by each task. To determine the amount of consumable supply requirements, a patient-generating model was used to project the frequency of specific injuries and illnesses likely to occur in theater. Substantial reductions (approximately 30%) in the number of items, weight, and cube were achieved. By establishing the clinical requirement for each item pushed forward, the NHRC model was able to reduce the logistical burden carried by Marine Corps units and enhance far-forward clinical capability. One result of this research is an extensive database that catalogues patient conditions (PCs) and the tasks and supplies required to treat them. NHRC has incorporated the research and the database into ESP to provide users with the ability to calculate the supplies and equipment needed to treat a particular patient distribution. This system documentation is written to assist ESP users with planning medical resource requirements and to help ESP system administrators at NHRC with maintenance of the database and enhancements in program capability. It may also be used to perform an independent verification and validation of system capabilities. ESP uses casualty estimates, levels of care, and functional areas to calculate the supplies necessary to treat a defined patient stream. ESP is capable of offering the following levels of care: First Responder, Battalion Aid Station (BAS), Forward Resuscitative Surgery (FRS)/Shock Trauma Platoon (STP), Surgical Company (SC), Small Ships/Independent Duty Corpsman, Submarines, Landing Ship Dock/General Medical Officer, LHA/LHD, and Aircraft Carriers. ESP also offers the functional areas present at each specific level of care, and may be expanded to cover all the listed levels and their respective functional areas in the future. This document contains a general description of ESP, and detailed descriptions of its features and performance, design considerations, interfaces, security, delivery, installation, maintenance, and future development opportunities.

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